

CYRTOCARA LIEMI, A PREVIOUSLY UNDESCRIBED
PAEDOPHAGOUS CICHLID FISH (TELEOSTEI:
CICHLIDAE) FROM LAKE MALAWI, AFRICA

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Abstract.—A new Lake Malawi paedophagous cichlid, *Cyrtocara liemi*, is described. *Cyrtocara liemi* is probably most closely related to *C. orthognathus*. The ecology and behavior of *C. liemi* is discussed briefly.

The cichlid species flocks of the Great Lakes of East Africa are the most spectacular examples of speciation and adaptive radiation in any vertebrate family. Each of the lakes, Malawi, Tanganyika and Victoria, contains more species of fish than any lake outside the Rift Valley region. Lake Malawi has about 300 described species of fish, 90% of which are cichlids, and 100–200 are believed still to be described (pers. obs.; Marsh *et al.* 1981). Cichlids are well known for their great diversity of feeding adaptations (Fryer and Iles 1972) which allows them to exploit a wide array of foods, including fish eggs, fish embryos and fish larvae. The existence of paedophagous species, i.e. those which primarily exploit fish embryos and larvae, was first reported for the Lake Victoria cichlid flock (Greenwood 1959, 1967, 1974). At least three species of paedophagous cichlids occur in Lake Malawi, *Cyrtocara orthognathus* (Trewavas, 1935) and two undescribed cichlids (McKaye and Kocher, in press). This report describes the one of those paedophagous species of which we have sufficient material. The counts and measurements employed follow Barel *et al.* (1977).

Cyrtocara liemi, new species

Fig. 1

Holotype.—National Museum of Natural History (USNM) 227497, adult male, 175 mm standard length (SL) from W. Thumbi Island, Lake Malawi, Malawi (34°40'E, 14°01'S), collected by K. McKaye, T. Kocher and M. Oliver, Field No. MKO 80-49, July 1980.

Paratypes.—USNM 227498 (4 specimens, 136.2 mm, 154.1 mm, 166.5 mm, 175.2 mm SL, north side of W. Thumbi Island); 227499 (2 specimens 191.3 mm, 174.2 mm SL, south side of W. Thumbi Island); 227500 (1 specimen, 178.3 mm SL, Chikale Beach, Nkhata Bay, 34°17'E 11°35'S); 227501 (1 specimen, 124.3 mm SL, swamp east of Chembe village, Nankumba Peninsula, 34°51'E, 14°01'S); 227502 (1 specimen, 131.8 mm SL); 227503 (1 specimen, 130.4 mm SL, Otter Point 34°48'E, 14°02'S); 227504 (2 specimens, 60.7 mm, 62.4 mm SL, south east corner of W. Thumbi Island).

Diagnosis.—*Cyrtocara liemi* is similar to and probably most closely related to another paedophagous cichlid *C. orthognathus* (Fig. 2). The two species can be easily distinguished by the profile of the head, particularly gape inclination, which in *C. liemi* is 40–60° (\bar{x} = 43.4) but in *C. orthognathus* is 60–80° (\bar{x} = 66.6), and



Fig. 1. Holotype of *Cyrtocara liemi*; USNM 227497.

the premaxillary pedicel inclination, which ranges from 20–30° (\bar{x} = 23.7) in *C. liemi* and 0–10° (\bar{x} = 1.1) in *C. orthognathus*. Both species belong to a distinct group with a single oblique stripe within the genus *Cyrtocara* and are restricted to Lake Malawi.

Description.—This description is based on the holotype (Fig. 1) and twelve paratypes, ten adults 124.3–191.3 mm SL and two juveniles 60.7 mm and 62.4 mm SL. The principal morphometric ratios are given in Table 1.

The portion of the head anterior to the interorbital region is concave in profile in larger specimens and nearly straight in smaller specimens. Premaxillary pedicel inclination 20–30°. Inclination of the dorsal head profile 28–40°. Snout 1.2–1.6 times longer than broad. Cephalic laterosensory pores and canals not hypertrophied.

Posterior margin of maxilla does not extend to the vertical through the anterior margin of orbit. Jaws narrowly rounded when viewed from above. Lips not noticeably thickened. Lower jaw projects slightly. Gape inclination 40–60°. Lower jaw 1.15–1.98 times longer than broad.



Fig. 2. Syntype of *Cyrtocara orthognathus* from British Museum; BM(NH) 1936.6.14.

Table 1.—Principal morphometric ratios of *Cyrtocara liemi*. % = percent of head length, * = percent of standard length, M_a = mean of adult specimens, M_j = mean of juvenile specimens. R_a = range of adult specimens, R_j = range of juvenile specimens.

Character	M_a	R_a	M_j	R_j
Standard length mm	157.9	124.3–191.3	61.6	60.7–62.4
Body depth *	38.5	36.1–42.1	37.1	34.6–39.5
Head length mm	51.3	39.5–61.0	22.1	21.3–22.9
Head length *	32.5	31.4–33.8	34.1	32.4–35.9
Head breadth %	37.9	36.4–40.3	40.1	39.3–40.8
Interorbital width %	21.0	19.7–22.1	19.3	17.9–20.7
Snout length %	37.1	34.7–39.1	31.1	28.8–33.3
Orbit length %	24.6	22.5–26.5	29.0	28.2–29.7
Cheek depth %	19.8	17.0–22.0	12.2	12.2–12.2
Post-orbital head length %	40.5	38.2–42.9	36.4	36.1–36.7
Upper jaw length %	34.4	32.6–36.2	33.5	31.5–35.4
Premaxillary pedicels %	27.0	25.4–30.4	31.5	29.1–33.2
Lower jaw length %	44.2	42.7–45.9	44.8	43.2–46.3
Predorsal length *	33.8	33.1–34.6	36.4	32.3–40.5
Dorsal fin base *	57.6	53.9–59.1	57.5	55.5–59.5
Caudal peduncle length *	15.3	13.9–17.5	16.7	16.5–16.8

Caudal peduncle 13.9–16.8% SL. 1.15–1.5 times longer than deep.

Dorsal fin with 27 (1), 28 (10) or 29 (2) elements, comprising 16 (1), 17 (10), 18 (2), spines and 10 (2), 11 (9) or 12 (2) segmented rays; last spine 11.9–15.3% SL. Anal fin with 10 (1), 12 (3) or 13 (9) elements, comprising 3 spines and 7 (1), 9 (3) or 10 (9) segmented rays. Pectorals 27.8–32.5% SL comprising 11–14 segmented rays. Pelvic fins 23.9–31.1% SL, comprising 5 segmented rays. Caudal fin emarginate, lobes pointed, subequal, scaled over entire surface.

Scales ctenoid. Lateral line with 31–34 pored lateral line scales (mode 31), upper part 23–26 (mode 25), lower part 6–9 (mode 8) Cheek with 3–4 rows (mode 3); uppermost scale often significantly larger. 5 to 7 scales between dorsal-fin origin and lateral line (mode 5). 7 to 9 scales (mode 8) between pectoral and pelvic-fin bases, scales gradually decreasing in size from pectoral fin to pelvic fin. Sixteen scales around caudal peduncle.

Four gill rakers on epibranchial + 1 (in angle) + 10 (1), 11 (11), 12 (1) on ceratobranchial. Anterior 4 on ceratobranchial often short, peg-like, remainder longer, some club-like and bent laterally.

Outer tooth row of upper jaw with a total of 42–60 teeth in adults; two juvenile specimens with 38 and 39. Outer rows of teeth of both upper and lower jaws composed of somewhat recurved, slightly movable teeth, embedded in fleshy gums. Teeth broad, long, and unequally bicuspid anteriorly, becoming shorter, more slender, and unicuspid posteriorly. Anterior teeth pale, distal portion rusty brown, color decreasing in extent and intensity in more posterior teeth; posterior-most teeth uniformly pale. In bicuspid teeth, lateral margin of major cusp convex, medial margin concave; inner margin of minor cusp more oblique than outer. Major cusp usually, but not always, anterior to minor cusp. Teeth of larger specimens uniformly unicuspid. Inner tooth rows irregular, 2–3 rows on upper and lower jaws, teeth unicuspid, occasionally weakly tricuspid with middle cusp extended.

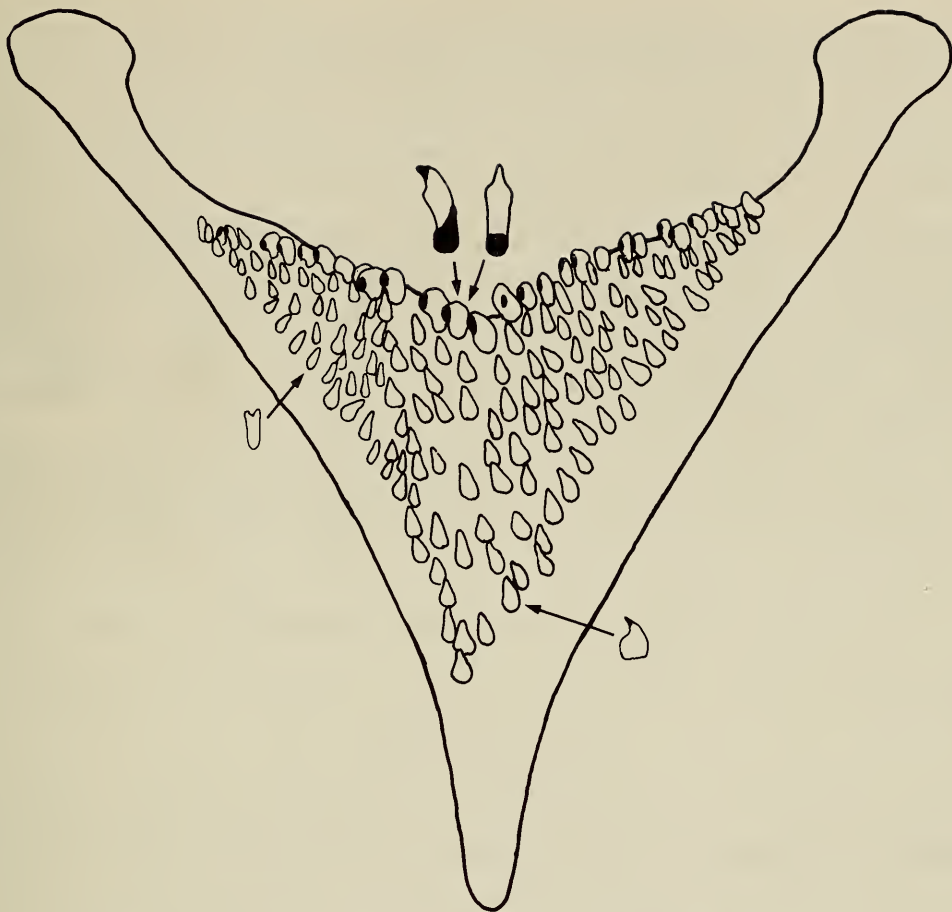


Fig. 3. Lower pharyngeal bone of *Cyrtocara liemi* in occlusal view.

Lower pharyngeal bone ($n = 7$) (Fig. 3) triangular in outline, 1.13–1.5 times broader than long, its length 10.9–28.4% of head length, breadth 57.1–72.7% of head breadth. Suture between two halves straight. Dentigerous area 1.2–1.6 times broader than long. Teeth variable. Postero-median teeth large but decreasing in size toward end of row, weakly bicuspid, with posterior cusp longest and colored rusty brown at tip and curved forward slightly. Lateral teeth compressed, bicuspid or unicuspid, paler in color. Teeth closely packed posterolaterally, more openly packed medially, 29–35 teeth in posterior row, 5–11 in median row, 4–8 in oblique rows, and 19–26 in lateral rows.

Coloration in preservation.—Both sexes with head and dorsal surface dark grey-brown, paling posteriorly and ventrally. Sides with single oblique stripe, divided into 3 overlapping sections. Anterior section extending posteriorly to scale 13–18 of lateral line, beginning above the upper part of the lateral line and crossing over it at scale 7–8. Middle section extending from scale 7–9 to scale 19–28, between upper and lower lateral line sections. Posterior section beginning at scale 16–19 and extending along upper side of lower lateral line to base of caudal fin where it dips slightly below the lower lateral line. Fins translucent brown-grey, with pale maculae. Juveniles pale yellow-brown. Oblique stripe composed of discontinuous segments. 10 vertical bars distinguishable. Fins colorless to grey, translucent.

Distribution.—This species is not common, but it does occur in the Cape Maclear (Nankumba Peninsula) region of Lake Malawi as well as in Nkhata Bay. It

was caught and observed by SCUBA divers (McKaye and Kocher, in press) only in areas where brooding cichlid females congregated.

Relationships.—An analysis of the phylogenetic relationship of *C. liemi* must await revision of the genus *Cyrtocara*, which includes the group of obliquely-striped species of which the paedophages *C. liemi* and *C. orthognathus* are members. These fishes with a single oblique stripe have been grouped by Trewavas (1935) in her key and may represent a monophyletic group. *Cyrtocara liemi* and *C. orthognathus* occur sympatrically at Cape Maclear and at Nkhata Bay. Not only do they differ significantly in morphology, they also differ in behavior.

Etymology.—Named after Karel Liem in recognition of his pioneering studies and his insight into the feeding mechanism of cichlid fishes.

Ecology.—*Cyrtocara liemi* is a paedophagous cichlid which acquires eggs, embryos, and fry from the mouths of mouthbrooding cichlids. *Cyrtocara liemi* attacks females from 0.5 to 2 m below and hits them in the hyoid region of the head. The only items found in their stomachs were eggs, embryos and larval cichlids. A more detailed description of their behavior and ecology along with two other paedophagous cichlids is discussed elsewhere (McKaye and Kocher, in press).

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